EMERGING TRENDS OF ARTIFICIAL INTELLIGENCE TECHNOLOGY WEARABLE DEVICES IN INFANT CARE

Ms. X. Emerensia* | Dr. A. Velmurugan**

**Research Scholar, Himalayan University, Itanagar, Arunachal Pradesh, India. & Principal, RVS College of Nursing, Sulur, Coimbatore, Taminadu, India.*

***Research Supervisor, Himalayan University, Itanagar, Arunachal Pradesh, India.*

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ABSTRACT

In the rapidly changing world, the integration of artificial intelligence (AI) technology provides a thoughtful insight into the healthcare of infants. AI technology is used to understand complex human health conditions and diseases to improve individualised care and wellbeing through personalised healthcare delivery system. It captures and uses continuous physiological data for monitoring, early detection, diagnosis, treatment choices, treatment decisions, prediction, prognosis as well as providing care to infants and children. It is already becoming a part of daily practice through AI wearable with tracking apps linked on smart phones and computer for clinical decision at fingertips. AI wearable devices are very useful to monitor infant vital parameters, position changes, chest movement, falls and skin temperature, sleep quality etc. However, before making AI an integral part of infant care, it is essential to evaluate the technology from a human perspective, ensuring its technology readiness, AI accountability and ecological validity. This article summarises an insight about some recent AI wearable devices which provide new possibilities in infant wellbeing and quality care for the clinicians, nurses, parents, caregivers and proposes related challenges.

Keywords: *Artificial Intelligence, infant care, wearable devices*

ABOUT AUTHORS:

Ms. X. Emerensia is Research Scholar, Himalayan University, Itanagar, Arunachal Pradesh, India. & Principal, RVS College of Nursing, Sulur, Coimbatore, Taminadu, India.

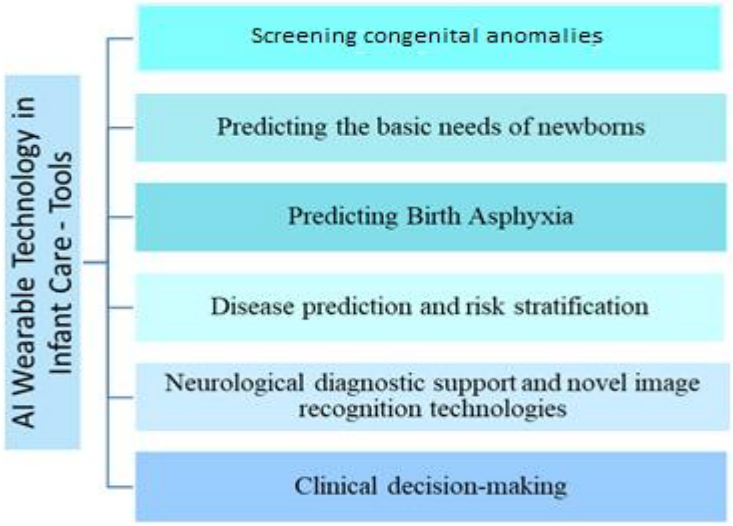
Prof. (Dr.) A. Velmurugan is Ph.D. in Nursing. He began his profession as a clinical instructor, Assistant professor, Associate professor and professor in college of Nursing. He is Head, Department of Medical & Surgical Nursing, St. John's College of Nursing, Kattappana, Kerala, India.

INTRODUCTION

Infant care is becoming increasingly complex with large amounts of rich, routinely recorded physiological, diagnostic and outcome data. Infants, especially new-borns need resuscitation, a complete physical examination, administration of prophylactic medications and vaccines, adequate feedings, safe sleep, hygiene ensuring wellbeing of newborns. Also, sometimes the baby may have risk of fatal decompensation. If there is any delay in treatment or minor errors in medication dosage it can affect baby's health. In such situation, health care team members are expected to deliver prompt decision making to identify the problems and provide treatment plan to the baby. The integration of Artificial Intelligence (AI) in infant care will help to safeguard babies and can provide quality care to them. It is a powerful tool to support clinical decision making, personalised care, precise prognostics, and enhance child safety. Current AI approaches through wearable devices in infant care monitor baby's breathing and movements, heart rate, blood pressure, position changes, chest movement, falls, pulse, skin temperature, sleep patterns, sleep quality, sleep activity, respiration rate, oxygen levels during sleeping, diaper change time and so on. So an AI wearable device plays an important role in supporting clinicians, nurses and parents in taking care of infants.

WEARABLE TECHNOLOGY

Wearable technology is any kind of electronic device designed to be worn on the user's body. Wearable AI can monitor and analyse the user's speech patterns, heartbeats and assess their moods and inform about warning signals. It can be worn as accessories such as smart watches, VR headsets, smart jewellery, smart toys, smart button, web-enabled glasses and Bluetooth headsets which can be embedded in clothing, implanted in the user's body, or even tattooed on the skin.


AI Wearable Technology in Infant Care - Tools
Screening congenital anomalies
Predicting the basic needs of newborns
Predicting Birth Asphyxia
Disease prediction and risk stratification
Neurological diagnostic support and novel image recognition technologies
Clinical decision-making

Wearable Technology in Infant Care – Tools

WEARABLE DEVICES IN INFANT CARE AND ITS APPLICATION

Levana Oma Sense wearable

Levana Oma Sense is a wearable device in the form of diaper clip for monitoring the baby's breath and abdominal movement. The device is completely cordless, zero contact with baby skin, no Wi-Fi and Bluetooth frequencies and produce vibration, sound alert and uses patented wakeup technology to stimulate baby after sensing no movement for about 15 seconds. The randomised vibrations and alerts re-establish the baby's regular movements.

Snuza Hero (SE) wearable

Snuza Hero (SE) Sense is a wearable device in the form of baby abdominal movement monitor used as diaper clip. It can be easily clipped onto baby's diaper or clothes. It monitors baby's breathing movement and will attempt to gently rouse the baby after 15 seconds of no breathing movement and will alarm after 20 seconds of no breathing movement of baby alerting the nurses/caregivers to act quickly.

MonBaby monitor

MonBaby monitor is a wearable device in the form of a shirt button. It is highly portable, simple to use, and gives a little more information beyond the baby's motion indicative of breathing. It monitors the child and gives alert on the smart phone with a pop-up notification for things like position changes, chest movement, a fall and temperatures outside of the set range.

Mimo turtle as shirt attachment

Mimo turtle is a wearable device in the form of a baby shirt attachment which measures infant respiration, pores and skin temperature, frame position, sleep patterns and interest levels. Mimo app gives insight about baby's sleep quality, sleep activity, respiration, frame position, and skin temperature. The Mimo Baby Shirt kimonos are available for the babies in 0-3 months, 3-6 months, and 6-12 month variants.

Sproutling baby monitor

Sproutling baby monitor is a small wearable sensor that will strap baby's ankle and will constantly check things like a baby's heart rate, skin temperature, movement, sleep, as well as the room's temperature, humidity, noise and light levels. It converts the information monitored, into reports which will be available on an app that parents can access on smart phones and other devices

Owlet smart socks

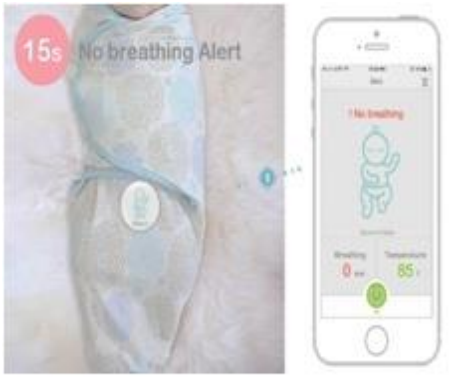
The Owlet baby monitor is a technology that comprises of a soft smart sock and a base station. Pulse oximetry sensor, hospital-grade non-invasive technology, embedded on the smart sock that fits snugly on the baby's foot to monitor his/her heart rate and oxygen levels during sleep. When a baby's heart rate or oxygen levels falls too low or high, the alarm on the base station will flash red light and app notification transmitted to parents' cell phone. Owlet baby monitor helps parents' anxiety-free sound sleep who are worried about the frightening possibility of sudden infant death.

Nanit plus

Nanit Plus is a smart baby monitoring technology that uses computer vision and machine learning to track baby's health vitals. It monitors background audio, humidity, and temperature readings and sleep tracking data with video of good image quality. It has features including nature sounds, two-way audio so that parents can talk to the child as well as listen and the ability to monitor baby's breathing. It also has a night mode to dim the screen while leaving it open at night for quick glances of the little one.

Sense-U Smart Swaddle

The Sense-U Smart Swaddle is a smart swaddle blanket that monitors baby's breathing, rollover and alerts of no breathing and stomach sleeping. It features the risk of SIDS (sudden infant death syndrome). The non-contact Sense-U baby monitor device easily clips onto the leg bag of the adjustable infant swaddling wrap, which provides secure hook and loop closures for easy, safe swaddling. The device detects the slightest tummy breathing movements, and triggers alarm sounds after 15 seconds of no breathing, stomach sleeping and abnormal temperature and humidity levels.



Neebo baby sensor wristband

Neebo is the smallest smart wristband for babies and toddlers. It measures child's vital signs including their breathing, heart rate, oxygen saturation levels, temperature sensor, notifies parents if their baby is too hot or too cold, also records the baby's sleeping patterns and offers parents the peace of mind that their little one is alright. It records a child's vital signs and displays them in real time on a smart phone via the free Neebo app. The sensor wristband is suitable for children up to three years of age.

BENEFITS OF AI WEARABLES

- Real-time monitoring of infant health and providing wide range of valuable data
- Improve wellbeing and quality outcome of infant
- Reduce the cost of healthcare and improve the safety of infant
- Monitor infant's health, which can help to identify the serious problems earlier and avoid larger consequences.
- Improve the accuracy of clinical trial results.
- Wearables are portable, easy to carry, handle and store lending feasibility to use
- Reduce the workforce burden
- Track data for analysing hidden patterns of diseases for evidence-based decision making
- Track early detection and treatment of diseases and help clinicians to diagnose and treat rare diseases of infants.
- Track the infant sleep pattern and quality, track the infant while parents are at work
- Track the vital parameters of the infant with health issues like respiratory illness, or those with special needs.
- Wearables are used to collect, transmit and even analyse the data commonly collected from the infants body.

LIMITATIONS OF AI WEARABLES

- Devices are expensive
- Lack of knowledge on wearable technology
- Ethical concerns
- People who handle wearables may need skills to analyse the data
- Unavailability of mentors in guiding new technology

CHALLENGES OF WEARABLE

- Health personnel are not much interested in inculcating new wearable technology in infant care.
- Difficulties in clinical integration including the selection and validation of report
- Technology readiness and accountability of information recorded
- Validity and reliability of data security and privacy of information
- Maintenance and service of wearables
- Data transmission, processing and storage security
- Performance of the wearable device and battery capacity of wearable devices

CONCLUSION

AI wearable technology will be the game changer in the field of healthcare. The new wearable technology brings in tremendous changes in infant's quality of life. AI technology has great impact in reducing the stress levels of parents, clinicians and nurses. Globally AI will help to reduce the mortality and morbidity of infants in the present as well as in future years through real-time tracking of health parameters. The wearables bring immense value in capturing health data and it will be crucial for healthcare delivery in the future.

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